THE THONG ADJUSTER

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The unofficial online magazine of the Iron Thong Golf Gang

IN THIS Issue

The Putter speaks
A word from the editor

The Iron Thong gets the shaft!

Yes, this November issue of The Thong Adjuster officially gives the Iron Thong the shaft! Inside this special issue you will find everything you ever wanted to know about golf club shafts -- MOI, graphite vs. steel, spining, swingweight, torque, kickpoint -- so have a seat, turn on your reading light and grab your shaft, because November is Shaft Month!

All this great info comes from Tom Whison, who has been a member of the golf equipment industry for more than three decades, specializing in clubhead design, shaft analysis, and clubfitting research and development. He is the only designer from the component clubmaking side of the golf industry whose clubhead designs have been used to win on the PGA Tour and in the Ryder Cup, having designed clubs used by Scott Verplank, Bruce Lietzke, Ben Crenshaw and Payne Stewart.

Tom has written five books on clubmaking technology, he is a longstanding member of the *Golf Digest* Technical Panel, and serves as the Technical Advisor to PGA.com, the website of the PGA of America.

New member -- We have a new member. The ITG welcomes John "My Ball May Land" Neyland. John has already pocketed some of our hard-earned cash, so let's keep an eye on this guy!

See you next Saturday,
Steve

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Go to http://www.IronThongGolf.com to view the current issue.

Articles, including for sale items, can be submitted at any time. Send them to the editor at stevevanwert@hughes.net.

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Just 'fore' laughs

"I still can't believe Big John got a sex change so he could play from the women's tees!"

"Joe claims he shot his age today. He also claims he's ninety-seven!""

Everything you ever wanted to know about SHAFTS!

What makes finding the right shaft flex for my swing so important?

From Tom Wishon

If a golfer is using a shaft that is too stiff for his swing mechanics and swing speed, any or all of the following may result:

1. The ball flies lower for any given loft, and possibly shorter in distance, because the golfer's best launch angle for maximum distance cannot be achieved.
2. The ball may tend to "leak" to the fade side of the target because the golfer cannot cause the desired forward bending of the shaft at impact, which helps bring the face back around to a less open position at impact.
3. The shot will probably feel less solid and harsh, even when impact occurs in the center of the face, because of the different impact vibrations transmitted up the shaft to the golfer's hands.

If a golfer is using a shaft that is too flexible, here are the likely results:

1. The ball will possibly fly higher for any given loft. If the golfer is using the proper loft for his swing mechanics, this could cause a slight decrease from his maximum potential distance. On the other hand, if the golfer is using too little loft, which is the case with a very high percentage of players today with the driver and 3-wood, the more flexible shaft could bring his launch angle up to a more optimum trajectory, which could actually result in an increase in their distance.
2. The ball may tend to draw a bit more from the forward bending of the shaft at impact causing the face to rotate past square to be slightly closed. However, if the golfer happens to slice or fade the ball, this actually could help reduce such a mis-direction tendency.
3. The shot will feel more solid because impact vibrations transmitted up to the hands along a shaft which is both more flexible and more bent will feel more solid.

Thus each golfer must take a look at his or her natural swing tendencies before selecting the shaft flex best for their overall game. But at the end of the day, the majority of golfers with swing speeds of 100 mph and lower are going to do far more harm for their game by choosing a shaft that is a little too stiff rather than a shaft that ends up being a little too flexible. In short, when in doubt, always err on the side of more flexibility in the shaft.

Golf shaft FAQ's

MOI? This is the US of A, buddy -- why are you speaking French?

Question: What is Moment of Inertia (MOI)?

Answer: "Moment of inertia," or MOI, is a property of physics that indicates the relative difference in how easy or difficult it will be to set any object in motion about a defined axis of rotation. The higher the MOI of an object, the more force will have to be applied to set that object in a rotational motion. Conversely, the lower the MOI, the less force needed to make the object rotate about an axis.

To understand MOI, think of a spinning ice skater. At the beginning of the spin, the skater extends her arms and the rotation speed is slow. As the skater pulls her arms in closer to her body, the speed of the spin greatly increases. Thus when the arms are extended, the skater's Moment of Inertia is very high, and the result is a slower spin because the high MOI of the skater is resisting the speed of rotation. Conversely, the reason the spin speed increases when the skater pulls in her arms is that as the arms get closer to her body, the skater's MOI falls lower and lower, creating little resistance to the rotation.

There are several different moments of inertia that are factors in the performance of a golf club. Remember, MOI has to first be defined by identifying what axis the object is rotating around. There is an MOI for the whole golf club which, when swung, is "rotated" around the golfer during the swing.

There are also three different MOIs which can be measured for the clubhead itself. Two of these MOIs are important in the design of any clubhead.

First, when you hit a shot off the center of the face, even though the head is secured to a shaft, the head will try to rotate around the vertical axis going through the clubhead's center of gravity. Second, and at the same time, when the golfer swings the club on the downswing, the clubhead is rotating around the axis through the center of the shaft.

The first example refers to the MOI of the clubhead about its center of gravity. In marketing terms, this is the head design property that has a bearing on the amount of "forgiveness" a clubhead offers for off-center strikes. The larger the clubhead, and/or the more the designer incorporates perimeter weighting, the higher the MOI of the clubhead about its center of gravity vertical axis will be. The higher the MOI of the head about its vertical CG axis, the less the head will twist in response to an off-center hit, and the less distance will be lost from that off-center hit.

The smaller the head and the more head weight is positioned close to the center of the head, the lower the MOI of the head will be around its vertical CG axis, and the more distance will be lost when the ball is hit off center.

Again, higher MOI = more resistance to the object being rotated around an axis; lower MOI = less resistance to the object rotating around an axis.

The second example refers to the MOI of the clubhead about the shaft axis. Little is spoken about this MOI in equipment marketing, but it is an important head design factor that can affect the accuracy of the shot, not the distance. The bigger the head or the more weight that is placed far out on the toe of the clubhead, the higher the MOI of the head will be about the shaft's axis. The smaller the head or the more weight that is positioned in the heel area of the head, the lower the MOI of the head will be about the shaft's axis. The higher the clubhead MOI around the shaft, the more tendency there is for a golfer to leave the face open at impact. The lower the clubhead MOI around the shaft, the more tendency there is for a golfer to rotate the face more closed at impact.

As stated earlier, the whole golf club also has an MOI. The longer the club, the heavier the head, the heavier the total weight of the head, shaft and grip added together, the higher the MOI will be for the whole club. Conversely, the shorter the club, the lighter the head, the lower the weight of the head, shaft and grip, then the lower the MOI will be for the club.

The MOI of the club is important to matching the swing feel of all the clubs in the bag. Clubfitting theory states that if all clubs in a set are made to have the same, identical MOI, the golfer will be more consistent because each club will require the same effort to swing.

Did I get an A?

Question: What Do the Letters X, S, R, A and L Mean When They Appear on a Shaft?

Answer: Some golf shafts bend more than others, of course. The letter code represented by the letters L, A, R, S and X represents those different grades of flex.

"L" is the most flexible shaft and "X" is the stiffest shaft.

"L" denotes "ladies flex"; "A" denotes "senior flex"; "R" denotes "regular flex"; "S" denotes "stiff flex"; and "X" denotes "extra stiff flex."

Why is senior flex represented by an "A"?

When manufacturers first started using this code to denote the flex of their shafts, "A" stood for "amateur," but that level of flex later became associated with senior men.

What is 'torque?'

The term "torque" is taken to mean the shaft's designed resistance to twisting during the downswing. The torque value is expressed in degrees, so the lower the degrees of torque, the more resistance the shaft will have to being twisted from the force of the downswing on the clubhead attached to that shaft. The higher the degrees of torque, the less resistance the shaft will have to being twisted by the mass of the clubhead on the downswing.

In steel shafts, because the type of steel material is the same throughout the entire shaft, the torque exists in a very narrow range of degrees, one that is much more narrow than in graphite shafts.

Graphite shafts can be and often are made with a wide variety of different graphite fiber strength, stiffness and position on the shaft. This allows the torque in graphite shafts to range from as high as 7 or 8 degrees to as low as 1 degree, while in steel this range is only from a little more than 2 degrees to a little under 4 degrees. Therefore, torque is not a factor to worry about in the selection of a steel shaft, but it is a point to keep in mind for some golfers when selecting a graphite shaft.

Fortunately, the fitting ramifications of torque even in graphite shafts is not that severe. Simply stated, it means that if you are a big strong, powerful person with an aggressive swing tempo and a late release, you never want the torque in a graphite shaft to be any higher than 4 to 4.5 degrees. Otherwise, your strength and downswing force may cause the clubhead to twist the shaft, causing the clubface to be more open at impact, and resulting in a shot that hangs or fades to the right of your target.

Conversely, if you have a very smooth, rhythmic swing without a very aggressive downswing move, you do not want to use graphite shafts with the torque below 3.5 degrees or else the impact feel of the shot can be stiff, harsh and unsolid, and the height of the shot may be too low.

So for most golfers, as long the torque of a graphite shaft is between 3.5 and 5.5 degrees - which is the case for the vast majority of graphite shafts today - the golfer will be OK and torque will never be a factor to worry about in the shaft fitting.

What is 'kickpoint?'

"Kickpoint" is actually a passe term these days. Kickpoint is an old term in shaft design that was used to try to describe how the shaft's overall stiffness or flexibility was distributed over the entire length of the shaft.

Today the term kickpoint is being replaced by the phrase "bend profile." The reason is that kickpoint connotes the thought that the shaft has a "hinge," which is definitely not true. "Bend profile," on the other hand, offers the explanation that the shaft's overall stiffness may vary intentionally over its entire length as a way to change the bending feel and the trajectory the shaft offers to the flight of the ball.

By varying the outer and inner diameters of the shaft, along with the wall thickness in-between at any point along the shaft, it is possible to make shafts of the same overall stiffness but which differ in where they are more or less stiff. For example, it is possible to make two shafts of the same letter flex - such as an R-flex - that are different in their bend profile design. One shaft can be an R-flex but be more flexible in the tip end of the shaft, while another R-flex shaft can be made to be more tip-stiff. Same thing with the grip end of the shaft as well as the center section area of shafts.

Different bend profile designs of the same letter flex (i.e., R-flex) exist to help better match the bending feel and the trajectory the shaft offers the shot to the golfer's swing motions of transition, tempo and release. The smoother the transition, the less stiff the grip end of the shaft should be; the more forceful the transition, the stiffer the grip end of the shaft needs to be to fit the golfer. The earlier the golfer's release of the wrist-cock, the more flexible the tip section should be; conversely, golfers with a late release should use a shaft with a stiffer tip section design.

What is 'spining?'

It is almost impossible to manufacture shafts that have precisely the same stiffness in all possible directions of bending. To do so would require so many time consuming manufacturing procedures that the price of shafts would well more than double.

While the top-quality shaft makers do manufacture shafts with very high accuracy and consistency, there are shafts in the golf industry that possess a variation in the consistency of the stiffness about their circumference. When shafts are identified to be inconsistent in their stiffness, they are said to have a "spine."

Therefore, the practice of "spining" is offered by some custom clubmakers. Spining involves, first, locating the most consistent bending position of the shaft; and second, installing the shaft so that its most consistent bending position is pointing directly toward or directly away from the target line.

With the vast majority of quality shafts made today, there is little need to have the shafts checked for spine location and re-installed in the clubheads.

What is 'Frequency Matching?'

Special devices, available to clubmakers, can measure the stiffness of shafts through what is called "shaft frequency measurement." These types of electronic devices allow the shaft to be clamped, usually at the grip end, with either a weight attached to the head end (when testing a raw shaft) or the clubhead attached at the head end. The clubmaker pulls the shaft down, lets it go, and the shaft begins to oscillate up and down.

The stiffer the shaft, the faster the rate of oscillation; the more flexible the shaft, the slower the rate of oscillation. The frequency analyzer is designed to count the oscillation rate of the shaft and display the reading in the form of "cycles per minute" (a numerical value) on the LED display on the machine.

In a set of woods or irons, the frequency reading of the shafts in the clubs will normally increase from longest to shortest club in the set. However, due to many factors, the amount of increase from shaft to shaft is not normally in the same increment.

Some custom clubmakers offer the service of fine tuning the shafts when installed in the clubheads so that the increment of frequency increase from longest to shortest clubs in the set will be exactly the same from club to club. This is "frequency matching."

Frequency matching will make the progression of grip-end stiffness from club to club more consistent from longest to shortest clubs in a golfer's bag. But if the shaft weight, shaft flex and bend profile are not fit properly to the golfer, frequency matching will not help the golfer.

What is 'Weight?'

The weight of the shaft is the major factor in determining the total weight of all golf clubs.

While clubhead weight and grip weight can and do vary depending on the golfer's need for a higher swingweight (headweight) or a larger grip size (grip weight), neither the head nor the grip exist in nearly as wide a range of weights as does the shaft.

Shafts can be bought that weigh as much as 130 grams (4.6 oz.) or as light as 40 grams (1.4 oz.). Thus, when a golfer switches from an average steel shaft to an average graphite shaft today, the drop in total weight will be in the area of at least 50 grams or more (1.75 oz.).

Swing speed is the most direct factor affecting shot distance. The lighter the total weight of the golf club, the higher the swing speed the golfer should be able to generate with the club. However, the swingweight of the club must be fit properly to the strength and tempo of the golfer or else any significant decrease in the total weight of the clubs will simply result in a higher percentage of off-center hits, which in turn will reduce distance.

What about my putter? It's got a shaft, too

To golfers who have developed a very refined sense of feel, the flex of the putter shaft can be detected, and this could potentially lead to some doubt in the confidence of the golfer. But as to the question of whether a more flexible or more stiff shaft will actually affect the performance of the putt, no, there is no effect. The effect, if any, is on the feel of the putter to the golfer, not anything to do with distance or accuracy.

That being said, confidence with the putter is probably the most important requirement any golfer has for being successful on the greens. So if you sense that you feel the shaft bending during longer putts and you do not like that feel, by all means replace the shaft with one that is more stiff. That should change the feel and improve your confidence.

But if you feel nothing with the shaft when you hit a 60-plus-foot putt, forget about it. Fitting the length, the lie angle, the loft angle and for sure the swingweight of the putter is vastly more important in the putter.

With normal use - minus any outside damage - how long do golf shafts last?

Forever. Or rather, a whole lot longer than any of us will ever live!

Seriously, as long as a graphite shaft is not cracked and there is no sign that the layers of the graphite material are starting to delaminate (peel away), the shafts will last for as long as you have the clubs.

In steel shafts, as long as the shafts are not kinked, or badly pitted or rusted, they, too, will last forever and will never wear out.

It is a myth to think that any shaft will "wear out" or suffer from "fatigue" to the point that it no longer performs the same - so long as the shaft is not damaged or bent.

Is steel or graphite best for you?

The number one difference between graphite and steel shafts is their weight. While steel shafts today can be made to weigh as little as 90 grams (3.2 oz.), and some graphite shafts as heavy as 120 grams (4.2 oz.), the big reason graphite shafts became popular is their ability to offer stiffness and durability suited to the most powerful swings while being very light in weight.

Remember, the shaft's weight is the number one factor that controls the total weight of the entire golf club. Lighter total weight equals the potential to increase the golfer's swing speed, which equals the potential to increase the distance of the shot.

The average steel shaft today weighs between 115g to 125g (4.0 to 4.4 oz.). Put that together with a typical 195-gram (6.9-oz.) driver head and a normal 50-gram (1.75-oz.) grip and you have a total weight for the driver of some 365 grams (12.9 oz.).

Most graphite shafts for drivers today are made to a weight of around 65-70 grams. Assemble that with the driver head and the grip and the total weight of a typical graphite shaft driver will be about 11 oz. That 1.9-oz.-lighter total weight (compared to the typical steel-shafted driver) can mean as much as 2-4 mph more swing speed for the golfer, which in turn translates to about 6-12 yards more distance.

Makes it sound like all golfers should be using graphite shafts in all their clubs, right? On the surface that is true. However, some golfers who are very strong physically, and/or who are quick to very quick with their swing tempo, need to have a little heavier total weight to help them gain a little more control over their swing.

In addition, steel and graphite shafts are totally different in the manner in which they transfer the vibrations from impact up to the hands, which in turn affects the feel of the shot. Simply stated, some golfers prefer the more crisp, sharper feel of hitting the ball with steel shafts, while some prefer the softer, more dampened feel of graphite.

If gaining more distance is a primary goal for the golfer, they should definitely be fit with the proper graphite shaft design in their woods and irons to match their swing. On the other hand, if distance is not the main focus for the golfer because they already have a high swing speed, if they like the feel of steel and their swing tempo matches a little better to the higher total weight steel shafts bring to the clubs, then steel is the better option.

How are golf shafts made?

Graphite

Graphite shafts start out as successive layers of graphite fibers held together by a resin (a form of epoxy) that is called a "binder" material. These sheets of graphite fiber-plus-binder material are called "pre-preg." The graphite fibers used to make the pre-preg sheets can vary in strength and stiffness (called the "modulus" of the graphite material) to afford the shaft designer more creativity in the performance design of the shaft.

These pre-preg sheets of graphite-plus-binder are tightly wrapped around a solid steel forming mandrel (a mandrel is a metal rod around which other material is formed into shape). The mandrel dictates the inside diameter, or core, of the shaft. That diameter, plus the number of layers wrapped around the mandrel and the variety of pre-preg material used, determines the weight and stiffness.

More layers wrapped around the mandrel equals greater wall thickness, which equals a stiffer and heavier shaft.

Once all the prescribed individual layers of the pre-preg graphite material are tightly wrapped around the forming mandrel, a thin wrap of cellophane is added over the shaft to hold the pre-preg layers in place. The shafts are then put into special ovens whose heat causes the binder material to slowly "melt," fusing all the pre-preg layers together into one contiguous tube of graphite.

After baking, the forming mandrel is pulled out of the inside of the shaft through the grip end of the shaft. The cellophane covering is stripped off, the shafts are sanded smooth on their surface and then painted in the cosmetic scheme dictated by the customer.

Steel

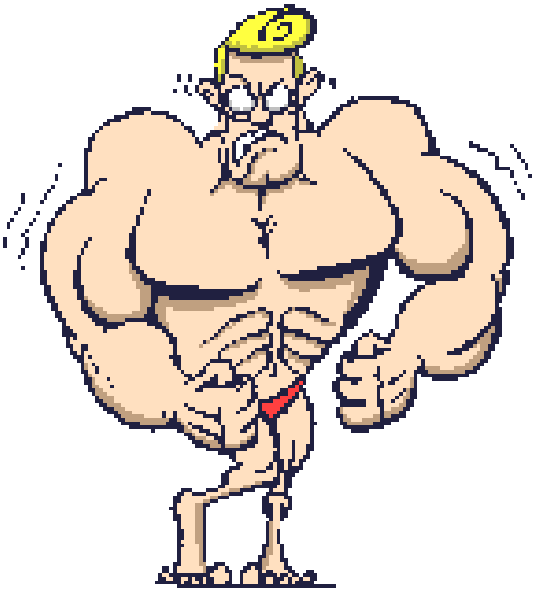
There are two primary ways to manufacture steel golf shafts: "seemless" and "welded tube" construction.

A seamless steel shaft starts life as a large cylinder of solid steel. The cylinder is heated and pierced with a special machine, turning the solid steel log into a large, thick-walled tube. Over a series of stretching operations on very specialized machines called draw benches, the large, thick tube is gradually reduced in diameter and wall thickness to become a thin-walled steel tube five-eighths of an inch in diameter. These shaft "blanks," as they are called, are then subjected to a series of squeezing operations that form the individual sections of diameter reduction called the "step-downs" on the shaft.

A welded tube construction steel shaft begins as a flat strip of steel that is coiled and welded into a tube. The welding procedure is quite different than what most people are used to seeing. Through what is called high-frequency welding, the two ends of the coiled strip are literally fused together without the presence of a second, different material as in the case of most welding. A special machine then removes the excess metal from the outside and inside of the welded tube in a procedure called "skiving." Once formed, the tube is stretched down to the required 5/8-inch outer diameter in the same procedures used in the forming of the seamless steel shaft, with the step-downs formed in the same manner as well.

Once formed into the step pattern dictated by each individual shaft design, the raw steel shafts are heat treated, straightened and then nickel-chrome electroplated to prevent rusting.

What is 'Swingweight,' and does every golfer need to worry about it?



In non-technical terms, swingweight is a measure of how the weight of the club feels when it's swung. Why is it important? Because if your clubs do not match in swingweight, they may not all feel the same to you during your swing.

Swingweight and the actual weight of the club are different things, and understanding the difference goes a long way toward understanding the role of swingweight.

The actual weight of a golf club is expressed in grams. Swingweight is expressed as "C10" or "D1" or some other combination of letter and number (more on that in a sec). Those measurements are taken using a swingweight scale, the contraption pictured at the top of this article.

Take a club, say a 3-iron. Imagine adding lead tape to the 3-iron. No matter where you put the lead tape, the actual weight of the club will be identical. That is, if the lead tape is on the clubhead, at the middle of the shaft or on the grip, the club's actual weight will be the same - the original weight of the club plus the weight of the lead tape.

Now imagine swinging that 3-iron with the lead tape on the clubhead, then at the middle of the shaft, then on the grip. How much weight you feel you are swinging will be different depending on where the lead tape has been added - even though the total weight of the club is identical in all three instances. That's swingweight.

The key application of swingweight is in matching the clubs within a set. You want all your clubs to feel the same weight during the swing. If you are replacing a club or adding one, you want the new club to match the swingweight of your current clubs.

But how important is swingweight, really? Recreational golfers who fancy themselves equipment "experts" - you know the type - might argue that it is very important, and for many golfers, they are right.

But not everyone is convinced that swingweight is something most recreational golfers need to lose sleep over.